

Calculus

Name \_\_\_\_\_

An object moves along a line so that its position at time  $t$  is given by  $s(t) = 2t^3 - 9t^2 + 12t - 7$  where  $t \geq 0$ .

- a. What is the object's position at time  $t = 3$ ?

$$s(3) = 2(3)^3 - 9(3)^2 + 12(3) - 7 = \boxed{2}$$

- b. What is the object's velocity at time  $t = 3$ ?

$$v(t) = 6t^2 - 18t + 12$$

$$v(3) = \boxed{12} \oplus$$

- c. What is the object's acceleration at time  $t = 3$ ?

$$a(t) = 12t - 18$$

$$a(3) = \boxed{18} \oplus$$

- d. Is the object speeding up or slowing down at  $t = 3$ ? Justify your response.

Velocity and Acceleration are the same  
Sign  
(both positive)

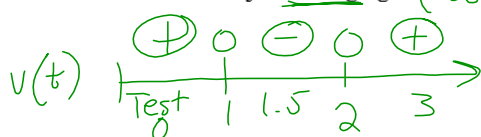
- e. When is the object at rest?

$$0 = 6t^2 - 18t + 12 \quad 0 = t^2 - 3t + 2$$

$$\frac{0}{6} = \frac{6(t^2 - 3t + 2)}{6} \quad (t-2)(t-1)$$

$$t = 2, 1$$

- f. When is the object moving right? (Pos  $v(t)$ )



$$[0, 1) \cup (2, \infty)$$

- g. How far does the object travel in the first 4 seconds?

position

$$|s(0) - s(1)| + |s(1) - s(2)| + |s(2) - s(4)|$$

$$|-7 - (-2)| + |(-2) - (-3)| + |(-3) - (-25)|$$

$$|-5| + |1| + |-28|$$

$$5 + 1 + 28$$

$$\boxed{34}$$